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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,890	02/27/2004	Klaus Florian Schuegraf	303.278US2	9295
21186	7590	12/22/2004	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			LEE, CALVIN	
			ART UNIT	PAPER NUMBER
			2825	

DATE MAILED: 12/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/789,890

Applicant(s)

SCHUEGRAF et al.

Examiner

Lee, Calvin

Art Unit

2825

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 23-64 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 23-64 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2/27/04</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "a spacer ... terminating at the boundary wherein the spacer is not in contact with the oxide layer", as recited in claim 41 must be shown or the feature canceled from the claim.

2. Figure 2C is objected to as failing to comply with 37 CFR 1.84(p)(5) because it includes the reference (220) not mentioned in the description.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 41 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claimed limitation of a spacer terminating at the boundary wherein the spacer is not in contact with the oxide layer is a contradictory statement and thus unclear as to how a spacer can terminate (i.e. reach and be in contact with) at the boundary between the feature and the oxide layer, and still not be in contact with the oxide layer.

Claim Rejections - 35 U.S.C. § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Note: This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 USC 103(a)

6. Claims 1-3, 5, 6, 8-11, 13-22, 25, 27-29, 31, 33-35, 38, 39, 41, 44, 46, 47, 50, 52, 53, 56, 58, 59, 62, and 64 are rejected under 35 U.S.C. 102(e) as anticipated by *Park et al*(5,545,578).

Park et al discloses a method of forming a structure for controlling current flow between a source/drain region in a semiconductor device, wherein the semiconductor device is composed of a semiconductor wafer layer, an insulating layer disposed over the semiconductor layer, and a conductive layer disposed over the insulating layer, the method comprising:

- forming a gate having sidewalls exposing the conductive layer and some portion of the insulating layer

- depositing a thin silicon nitride on the gate [Fig. 4G]

- avoiding depositing the thin silicon nitride on the source/drain region 26

- and reoxidizing the structure

- forming a layer of gate oxide **12**, **24** on a semiconductor layer and wherein:

- selectively etching further comprises selectively etching the semiconductor device to form one or more electrodes on the gate oxide, each electrode comprising a polysilicon **14a**, a refractory metal **16a**, a dielectric **18a**, and a surface of the feature comprises the sidewalls

- selectively depositing a first spacer **22a** of SiN deposited only on the surface of the feature [col. 4, ln. 55] on the sidewalls of each electrode, the first spacer extending to and terminating at a boundary between each electrode and the gate oxide and not being in contact with the oxide layer **12**, **24**

- reoxidizing the semiconductor device comprises forming a layer of reoxidation **28** on the first spacer and the gate oxide by a polycide reoxidation

Alternately, *Park et al* teach in figure 7F and related text substantially the entire claimed structure including a semiconductor electronic device comprising a first oxide layer **112**, **124**, at least one feature **114a**, **116a**, **118a** having a surface over the first oxide layer, a boundary between the feature and the first oxide layer, a spacer **122a** comprising silicon nitride deposited only on the surface of the feature, and a layer of reoxidation **128** on the spacer and the oxide layer forming a smile at the boundary between the feature and the oxide layer.

Claim Rejections - 35 U.S.C. § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 4, 7, 12, 26, 30, 32, 36, 37, 40, 42, 45, 48, 51, 54, 57, 60, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Park et al* in view of *Hurley* (US 6,350,780).

a) In re claims 4, 7, 12, 32, 37, 42, 48, 54, and 60, *Park et al* is silent about incubation time. *Hurley* discloses “using the predeposition of silicon, an incubation time for the start of silicon nitride nucleation at the electrode surface is decreased relative to the incubation time for the start of silicon nitride nucleation when silicon nitride is deposited without predeposition of silicon on the electrode surface ... deposition of silicon nitride on each of these surfaces also includes an incubation time at the start of the deposition where there is no apparent deposition of silicon nitride. This is particularly apparent where a cluster tool is not utilized” [col. 2].

It would have been obvious to a person of ordinary skill in the art to have modified the process of *Park et al* by utilizing an incubation time because the well-known incubation time varies depending on the material of a depositing layer and/or the conditions of a layer deposition

b) In re claims 26, 30, 36, 40, 45, 51, 57, and 63, *Park et al* is silent about temperature, pressure and flow rate in the SiN formation. *Hurley* suggests “a conventional method for deposition of the SiN ... preferred conditions including a temperature of 650-800°C, a pressure of 50-700 mTorr, and a flow ratio of 3:1 to about 10:1” [col. 4].

It would have been an obvious matter of design choice to have the claimed deposition’s temperature, pressure and flow ratio, since such a modification would have involved a mere change in the value of those temperature, pressure and flow ratio.

9. Claims 23, 32, 37, 42, 48, 54, 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Park et al* in view of *Hurley* and further in view of *Woo et al* (US 4,774,201).

The combination of *Park et al* and *Hurley* does not suggest the layer of reoxidation being formed by a polycide reoxidation. *Woo et al* discloses a silicide reoxidation technique, where a “CVD oxide layer operates to slow the passage of oxygen atoms to combine with the tungsten atoms of the silicide layer but allows free migration of silicon atoms from the polysilicon layer to the tungsten silicide surface and combine with the oxygen atoms” [Abstract].

It would have been obvious to a person of ordinary skill in the art to have modified the reoxidation of *Park et al* by utilizing a silicide reoxidation for the purpose of forming an uncontaminated reoxidation layer without the requirement of a substantially pure N ambient.

10. Claims 24, 33, 38, 43, 49, 55, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Park et al* in view of *Liao et al* (US 5,480,830).

Park et al does not suggest the electrode comprising an undoped silicon. *Liao et al* teaches a gate electrode comprising an undoped silicon [col. 2, ln. 16].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a gate electrode comprising an undoped silicon in *Park et al*'s device in order to use the device in an application which requires high operating voltages.

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896, Monday to Thursday, from 7 to 5 (ET). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* whose telephone number is (571) 272-1907.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The central fax number is (703) 872-9306 for all communications to be entered (e.g., amendments, remarks, IDS, etc.)

CL

C. Shuegraf
CALVIN LEE
PATENT EXAMINER

December 20, 2004